

## 3.2 Exchange rates: Freely floating exchange rates

### Learning Outcomes

- Explain that the value of an exchange rate in a floating system is determined by the demand for, and supply of, a currency.
- Draw a diagram to show determination of exchange rates in a floating exchange rate system.
- Describe the factors that lead to changes in currency demand and supply, including foreign demand for a country's exports, domestic demand for imports, relative interest rates, relative inflation rates, investment from overseas in a country's firms (foreign direct investment and portfolio investment), and speculation.
- Distinguish between a depreciation of the currency and an appreciation of the currency.
- Draw diagrams to show changes in the demand for, and supply of, a currency.
- Evaluate the possible economic consequences of a change in the value of a currency, including the effects on a country's inflation rate, employment, economic growth, and current account balance.

#### Glossary

**facilitate** make easy/possible

#### Subject vocabulary

**raw material** the basic material from which a good is made

**international trade** the cross-border exchange of goods and services

**foreign direct investment** cross-border investment, usually by firms, that involves the acquisition of assets in a foreign country. FDI can be the purchase of a minimum of 10% of the shares of a foreign company but also includes the creation of productive capacity.

**portfolio investment** the purchase of a variety of financial assets such as shares and bonds

### Explain why countries must exchange currencies in order to trade

Money is used to **facilitate** exchange. Money is used so that households can exchange their labour for money and in turn so that households can buy goods and services from firms. Buyers in the US earn dollars and firms in the US want to be paid in dollars. Firms in other countries have to be paid for their goods in their own currencies. For example, German firms want to be paid in euros for their goods. Importers of German goods in the US cannot pay the German firms in US dollars. Importers must exchange their dollars for euros so that they can pay the German firms in euros. German importers of US goods must exchange euros for dollars so that they can pay the US firms in dollars. The exchange of currencies allows money to be used to facilitate international exchanges. Currencies are exchanged on the foreign exchange market. This is a global market for the buying and selling of currencies.

### What is the exchange rate?

The exchange rate is defined as the rate at which one currency is exchanged for another currency. The equilibrium exchange rate is the exchange rate at which the demand for a currency equals the supply of that currency in the forex market. For example on 5 January 2014 the US dollar for euro equilibrium exchange rate was  $\$1 = \text{€}0.7357$  or  $\text{€}1 = \$1.359$  ( $1/0.7357$ ). This means that the price of  $\$1$  is  $\text{€}0.7357$  and the price of  $\text{€}1$  is  $\$1.359$ . At  $\$1 = \text{€}0.7357$  the market for dollars is in equilibrium as shown in Figure 73.1.

A US firm imports **raw materials** from Germany. The price for the raw materials is  $\text{€}10\,000$ . The US firm must pay the German firm  $\text{€}10\,000$ , therefore the US firm must buy  $\text{€}10\,000$  paying for it with US dollars. The exchange rate is  $\$1 = \text{€}0.7357$ . To calculate the amount of dollars needed to buy  $\text{€}10\,000$  divide 10000 by 0.7357:  $10000/0.7357 = \$13\,592.5$ . The US firm must exchange  $\$13\,592.5$  for  $\text{€}10\,000$  so that they can pay the German firm for the raw materials.

### What are the sources of the demand for, and supply of, currencies?

**International trade** leads to changes in the demand and supply of currencies. Buyers of imports must use their currency in order to buy another currency. For example, US importers of German goods supply US dollars to the foreign exchange market and demand euros. Therefore, when buyers in the US buy imported goods from Germany the supply of dollars increases and the demand for euros increases. When German buyers buy US goods the supply of euros increases and the demand for dollars increases.

**Foreign direct investment** leads to changes in the demand and supply of currencies. When US firms invest in Germany they supply dollars and demand euros. When German firms invest in the US they supply euros and demand dollars.

**Portfolio investment**, such as the buying of foreign company shares and depositing money in interest-earning saving accounts in a foreign bank, leads to changes in the demand and supply of currencies. When US institutions and individuals put their savings in German banks and other institutions they must exchange their US dollars for euros. They supply dollars and demand euros. When German savers put their money in US banks they must exchange their euros for US dollars. They supply euros and demand dollars. When US buyers purchase shares in German companies they supply dollars and demand euros. When German buyers purchase

shares in US companies they supply euros and demand dollars. Note that if a buyer purchases more than 10% of the shares of a foreign company, it is classified as foreign direct investment not portfolio investment.

**Speculation** leads to changes in the demand and supply of currencies. Traders of currencies buy and sell currencies in the foreign exchange markets with the aim of making a gain. For example, if some traders believe that the US dollar will rise in value in the future they will buy dollars thereby increasing demand for the currency. If some traders believe the value of the dollar will fall, they will sell dollars thereby increasing the supply of dollars.

## What is a floating exchange rate system?

In a floating exchange rate system the price of one currency in terms of another is determined by the demand for and supply of that currency in the foreign exchange market. When demand for the currency exceeds supply the currency rises in value against the other currency. This is called an appreciation of a currency. When supply exceeds demand, the currency falls in value against the other currency. This is called a depreciation of a currency. The government does not intervene in the market to increase or decrease the value of the currency. For example, the government will not sell its **foreign reserves** and buy its own currency in order to increase demand for the currency and thereby increase its value.

## Why does the demand curve for a currency slope downwards?

Figure 73.1 shows the market for US dollars in terms of the euro. When the price of \$1 = €0.7357 the market is in equilibrium. The quantity of dollars demanded and the quantity supplied are equal at  $Q_e$ .

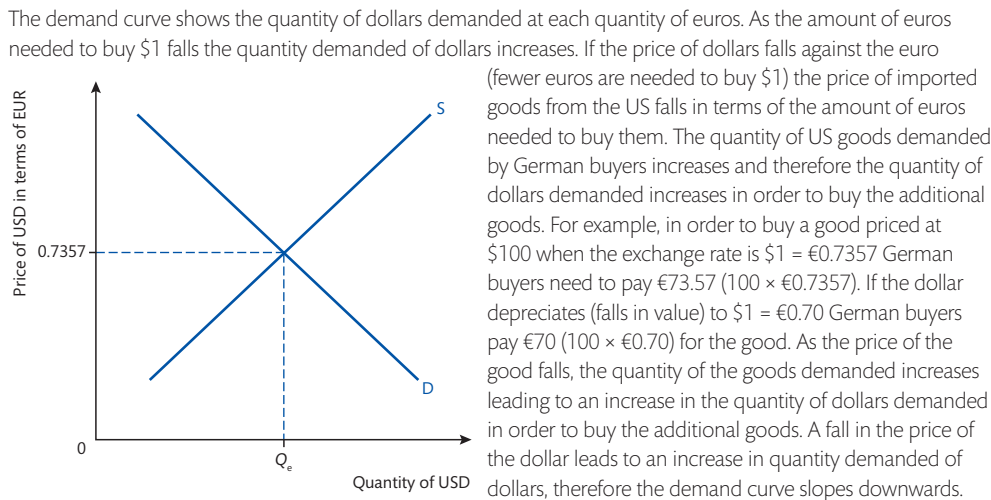


Figure 73.1

## Why does the supply curve of a currency slope upwards?

A fall in the value of the US dollar increases the amount of dollars needed to buy a given quantity of euros. In order to buy a German good priced at €100 when the exchange rate is \$1 = €0.7357, US buyers need to pay \$135.92 ( $100/0.7357=135.92$ ). If the price of the dollar falls to \$1 = €0.70 (a dollar buys fewer euros) the price of German imports increases. A good priced at €100 now costs \$142.86 ( $100/0.70=142.86$ ). As the price US buyers must pay for the German good increases, quantity demanded falls, therefore the amount of dollars supplied to buy the goods falls. A fall in the price of the US dollar leads to a fall in the quantity of dollars supplied, therefore the supply curve slopes upwards.

## Explain the causes of a shift of the demand and the supply curves

The various causes of a change in demand for, and supply of, a currency are discussed below.

## How does international trade in goods and services affect the demand for, and supply of, a currency?

When **national income** rises in Germany demand for **normal goods** increases, including demand for US imported goods. German buyers must buy more US dollars with their euros to pay for the goods. An increase in

### Glossary

**speculation** investing hoping to gain, but with the risk of loss

### Subject vocabulary

**foreign reserves** the amount of foreign currency and gold that is held by the Central Bank of a country

**national income** the sum of all income (wages, profits, rents, and interest) earned in a country in a given period of time

**normal goods** goods for which demand increases when income increases, and falls when income falls

## Subject vocabulary

**inflation** an increase in the general level of prices of goods/services in an economy over a given time period, usually a year

**interest rate** the percentage amount charged by a lender for money borrowed

the quantity of US exports leads to an increase in the demand for dollars, causing the demand curve to shift up and to the right from  $D$  to  $D_1$  as shown in Figure 73.2.

If US buyers demand more German goods because income in the US rises, they must buy more euros with their US dollars to pay for the goods. An increase in the quantity of US imports leads to an increase in the supply of dollars causing the supply curve to shift down and to the right from  $S$  to  $S_1$  as shown in Figure 73.3.

If **inflation** in the US is higher than in Germany, then US goods become relatively more expensive than German goods. Demand for German goods therefore increases and US buyers will buy more German goods; therefore, the supply of US dollars increases causing the supply curve to shift down and to the right from  $S$  to  $S_1$  as shown in Figure 73.3.

If inflation in Germany is higher than in the US, then German goods become relatively more expensive than US goods. Demand for US goods therefore increases and German buyers will buy more US goods; therefore, the demand for US dollars increases, causing the demand curve to shift up and to the right from  $D$  to  $D_1$  as shown in Figure 73.2.

### How does a change in the interest rate affect the demand for, and supply of, a currency?

If the **interest rate** in the US increases, savers in other countries including Germany will want to move some of their savings to the US. To do this, savers must exchange their currencies for dollars. German savers, for example, buy dollars and pay for them with euros. The demand for dollars increases and the demand curve shifts up and to the right as seen in Figure 73.2. The savings that are moved from one country's financial institutions to another country's financial institutions are called hot money. Hot money moves around the world, sometimes very quickly, in response to changes in the relative interest rates, as savers try to earn the highest returns.

If savers in the US move their savings to German financial institutions because the interest rate in Germany increases, the supply of dollars increases. Hot money flows out of the US into Germany. US savers buy euros with their dollars, therefore the supply of dollars increases causing the supply curve to shift down and to the right from  $S$  to  $S_1$  as shown in Figure 73.3.

### How does foreign direct investment affect the demand for, and supply of, a currency?

Long-term investment in a country by a foreign firm increases the demand for the currency of that country. For example, a German car manufacturer builds and manages a car factory in the US. To do this the German firm demands dollars and pays for them with euros. The demand for dollars increases and the supply of euros increases. The demand curve shifts up and to the right as shown in Figure 73.2.

Investment by US firms in Germany increases the supply of dollars because the firm must buy the euro with dollars. Demand for the euro increases and the supply of dollars increases causing the supply curve to shift down and to the right from  $S$  to  $S_1$  as shown in Figure 73.3.

### How does speculation affect the demand for, and supply of, a currency

If traders in currencies believe that the US dollar is going to rise in value against the euro they will sell euros and buy dollars. The supply of euros increases and the demand for dollars increases. The increase in demand for dollars causes the demand curve to shift up and to the right from  $D$  to  $D_1$  as shown in Figure 73.2.

If traders in currencies believe the dollar is going to fall in value they will sell dollars for another currency. The supply of dollars increases causing the supply curve to shift down and to the right from  $S$  to  $S_1$  as shown in Figure 73.3.

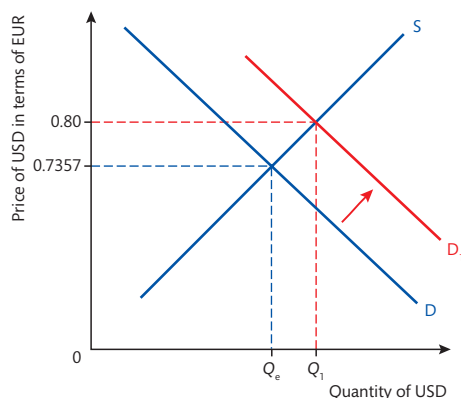


Figure 73.2

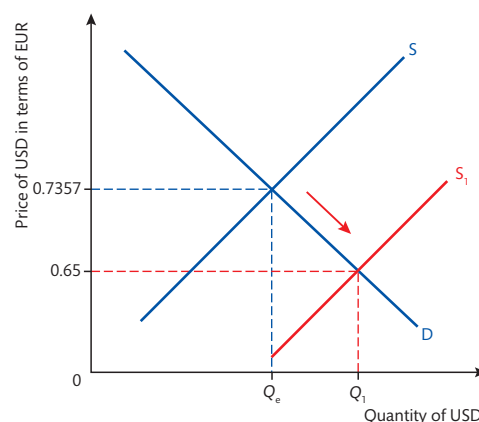


Figure 73.3

### Explain how changes in the demand for a currency affect its exchange rate

The equilibrium exchange rate is  $\$1 = \text{€}0.7357$ . Quantity of dollars demanded = quantity of dollars supplied at  $Q_e$ . Demand for the dollar increases, for example, when German buyers demand more US goods. The demand curve for dollars shifts up and to the right from  $D$  to  $D_1$  as shown in Figure 73.2. The market for dollars is now in **disequilibrium** at the original equilibrium exchange rate. At  $\$1 = \text{€}0.7357$  demand for dollars exceeds supply. The price of the dollar rises or appreciates against the euro until the market is once again in equilibrium at  $\$1 = \text{€}0.80$ . The price of a dollar rises from  $\$1 = \text{€}0.7357$  to  $\$1 = \text{€}0.80$ .

**Model sentence:** An increase in demand for a country's exports increases demand for its currency, leading to a rise in the exchange rate of that currency.

When speculators believe the dollar is overvalued and will fall in value in the future, the supply of the dollar increases. Speculators sell dollars and the supply of dollars on the market increases causing the supply curve to shift down and to the right from  $S$  to  $S_1$ . The market for dollars is now in disequilibrium at the original equilibrium exchange rate. At  $\$1 = \text{€}0.7357$  the supply of dollars exceeds demand. The price of the dollar falls or depreciates against the euro until the market is in equilibrium at  $\$1 = \text{€}0.65$ . The price of a dollar falls from  $\text{€}0.7357$  to  $\text{€}0.65$ .

If traders of currencies believe a currency will fall in value, they sell the currency and therefore it does fall in value.

**Model sentence:** When speculators believe a currency is overvalued and will fall in value, they sell the currency, leading to an increase in supply of the currency and a fall in the value of that currency.

**Model sentence:** An increase in demand for imports increases the supply of the country's currency, leading to a fall in the value of that currency.

### Evaluate the possible economic consequences of a change in the value of a currency

To answer this it is necessary to examine the advantages and disadvantages of changes in the exchange rate.

#### Discuss the advantages of an appreciating currency

As a currency appreciates in value the price of imported consumer goods falls. The fall in the price of these goods leads to an increase in the purchasing power of income. **Consumer surplus** increases and more wants can be satisfied with a given income. The price of imported **raw materials** also falls leading to a fall in the **costs of production** and possibly a shift of the **aggregate supply** curve down and to the right, thereby reducing the **price level**.

An appreciating currency might lead to lower prices of some domestically produced goods because domestic producers must compete against the relatively cheaper imports. They have to become more productively efficient in order to lower prices and survive in business. Therefore an appreciating currency in the long term can improve the **productivity** of domestic producers, lowering **average total costs** and increasing their international competitiveness.

#### Discuss the disadvantages of an appreciating currency

As a currency appreciates in value the price of imports falls and the price of exports rises. This could lead to an increase in the quantity of imports demanded and a fall in the quantity of exports demanded. The amount of income flowing out of the country to buy imports is greater than the flow of income coming into the country to buy exports, thereby increasing the **current account deficit** or reducing the **current account surplus**.

The increase in the price of exports leads to a fall in the quantity of exports demanded. In response, exporting producers reduce output. As output falls, **demand-deficient unemployment** increases. The fall in the price of imports leads to an increase in the quantity of imports demanded and a fall in demand for domestically produced goods. Domestic producers reduce output in response to a fall in demand and unemployment increases.

Therefore, a relatively high exchange rate can lead to a fall in **aggregate demand** and an increase in the **deflationary gap**. The price level falls but unemployment of labour and **capital** increases.

**Model sentence:** An appreciating currency reduces the price of imports leading to a fall in inflation. However, the price of exports increases, leading to fall in quantity of exports demanded and a rise in unemployment.

### Subject vocabulary

**disequilibrium** occurs in a market where the quantity supplied does not equal the quantity demanded at the actual price

**consumer surplus** the difference between the price a consumer is willing and able to pay and the price the consumer actually pays

**raw materials** the basic material from which a good is made

**costs of production** the amount the firm pays for the factors of production used to produce goods or services

**aggregate supply** the total supply of goods and services produced in an economy at a given price level in a given time period

**price level** the current weighted average price of a selected group of goods and services produced in a country over a period of time

**productivity** the quantity of output per unit of input

**average total cost** equal to total cost divided by quantity of output

**current account deficit** occurs when the amount of money flowing out of a country from the trade in goods and services, investment income, and transfers is greater than the amount flowing in

**current account surplus** occurs when the amount of money flowing out of a country from the trade in goods and services, investment income, and transfers is less than the amount flowing in

**demand-deficient unemployment** unemployment caused by a lack of aggregate demand. Unemployment changes as the economy goes through the business cycle, increasing when AD falls and decreasing when AD rises.

**aggregate demand** the total demand for goods and services in the economy at a given price level in a given period of time

**deflationary gap** the situation in which the actual output of an economy is less than its potential output

**capital** (goods) manufactured goods that are used in the production of other goods

## Subject vocabulary

**substitutes** a good that can be used in place of another good

**recession** two consecutive quarters of negative economic growth

**current account deficit** occurs when the amount of money flowing out of a country from the trade in goods and services, investment income, and transfers is greater than the amount flowing in

**current account surplus** occurs when the amount of money flowing out of a country from the trade in goods and services, investment income, and transfers is less than the amount flowing in

**resources** the inputs into the production process, the factors of production

**cost-push inflation** inflation caused by an increase in the costs of production, resulting in a decrease in aggregate supply

**price inelastic** the percentage change in quantity demanded/supplied < the percentage change in price

**expenditure** the price paid by buyers in exchange for goods and services. Total expenditure = price  $\times$  quantity purchased.

**purchasing power** a measure of how many goods and services a given amount of money can buy

**consumer surplus** the difference between the price a consumer is willing and able to pay and the price the consumer actually pays

## Discuss the advantages of a depreciating currency

As a country's currency depreciates in value, the price foreigners pay for its exports falls making exports more price competitive. This leads to an increase in the quantity of exports demanded. Exporting producers increase output in response to higher demand and unemployment falls. Exports are a component of aggregate demand and as aggregate demand increases, producers might have to invest in new capital in order to meet higher levels of demand. Investment is a component of aggregate demand, therefore aggregate demand increases further. At the same time the price of imports increases. Domestic **substitutes** become more price competitive leading to a fall in the quantity of imports demanded and a rise in the quantity of domestic goods demanded. Aggregate demand increases, firms respond by increasing output and unemployment falls. It is possible that a low exchange rate can help a country recover from a **recession**.

More income flows into the country to buy exports and less income flows out to buy imports, leading to a fall in the **current account deficit** or an increase in the **current account surplus**.

## Discuss the disadvantages of a depreciating currency

As a currency falls in value the price of imported consumer goods increases. The price of imported **resources** also increases leading to an increase in the costs of production leading to **cost-push inflation**. Inflation caused by the increasing price of imported goods is called imported inflation. If there are few or no substitute domestic consumer goods or resources, demand for imported goods might be **price inelastic**. Therefore as price rises quantity demanded falls but at a lower rate. And because **expenditure** on imports increases, the current account deficit rises.

Imported inflation leads to a fall in the **purchasing power** of income. **Consumer surplus** falls and fewer wants can be satisfied with a given income.

**Model sentence: A depreciating currency reduces the price of exports leading to an increase in the quantity of exports demanded and a fall in unemployment. However, the price of imported goods increases, leading to inflation.**

## Test your understanding of this unit by answering the following questions

- Describe the sources of demand and supply of a currency.
- Using a diagram, explain how changes in the interest rate can affect the exchange rate.
- Using a diagram, explain how changes in the international trade of goods can affect the exchange rate.
- Discuss possible consequences of a high exchange rate.
- Discuss possible consequences of a low exchange rate.

## Learning Outcome

- Calculate the value of one currency in terms of another currency. (HL)
- Calculate the exchange rate for linear demand and supply functions. (HL)
- Plot demand and supply curves for a currency from linear functions and identify the equilibrium exchange rate. (HL)
- Using exchange rates, calculate the price of a good in different currencies. (HL)
- Calculate the changes in the value of a currency from a set of data. (HL)

Calculate the price of \$1 in terms of the £ when the exchange rate is £1 = \$1.65 (HL)

$$£1 = \$1.65 \text{ therefore } \$1 = 1/1.65 = £0.606.$$

A firm in the UK buys raw materials from a firm in the US. The price of the raw materials is \$12 500. The exchange rate is \$1 = £0.606. Calculate the price of the raw materials in £s

$$\text{If } \$1 = £0.606 \text{ then } \$12\,500 = 12\,500 \times £0.606 = £7\,575.$$

A **linear function** is an equation that states how a **variable** is determined, the graph of which is a straight line. The **demand function**  $Q_d = a - bP$  states how **quantity demanded** of a good is determined by the price of the good. The **supply function**  $Q_s = c + dP$  is an equation that shows the relationship between price and **quantity supplied** of a good.

The linear equations for the demand and supply of a currency in the **foreign exchange market** are expressed in the same way as the linear equations for the **demand** and **supply** of a good in the goods market.

The linear demand equation for a currency is  $Q_d = a - bP$ . It shows the relationship between the price of a currency in terms of another currency and the quantity demanded.

$Q_d$  is the quantity demanded of the currency.

$P$  represents the exchange rate which is price of the currency in terms of another currency.

A change in the value of  $a$  changes demand for a currency.

The **coefficient**  $b$  determines the responsiveness of quantity demanded of the currency to a change in the exchange rate and therefore determines the slope of the demand curve.

The linear supply equation for a currency is  $Q_s = c + dP$ . It shows the relationship between the price of a currency in terms of another currency and quantity supplied.

$Q_s$  is quantity supplied of the currency.

$P$  represents the price of the currency in terms of another currency.

A change in the value of  $c$  changes the supply of a currency.

The coefficient  $d$  determines the responsiveness of quantity supplied of the currency to a change in the exchange rate and therefore determines the slope of the supply curve.

### Using the linear functions calculate quantity demanded and quantity supplied of £s when the exchange rate is £1 = \$1, £1 = \$2 and £1 = \$3 (HL)

The demand function for the £ is  $Q_d = 50 - 5p$  and the supply function for the £ is  $Q_s = 25 + 10p$

$$Q_d = 50 - (5 \times 1) = 50 - 5 = 45$$

$$Q_d = 50 - (5 \times 2) = 50 - 10 = 40$$

$$Q_d = 50 - (5 \times 3) = 50 - 15 = 35$$

$$Q_s = 25 + (10 \times 1) = 25 + 10 = 35$$

$$Q_s = 25 + (10 \times 2) = 25 + 20 = 45$$

$$Q_s = 25 + (10 \times 3) = 25 + 30 = 55$$

### Draw the demand schedule and supply schedule

Exchange rate	Qd of £s (billions)	Qs of £s (billions)
£1 = \$1	45	35
£1 = \$2	40	45
£1 = \$3	35	55

### Using the functions calculate the equilibrium exchange rate – a step-by-step guide

#### Trouble shooter

The equilibrium exchange rate is the rate at which quantity of the currency demanded = quantity of the currency supplied.

$$Q_d = Q_s \text{ when } 50 - 5p = 25 + 10p$$

$$50 - 5p = 25 + 10p \quad \text{simplify by subtracting 25 from both sides}$$

$$25 - 5p = 10p \quad \text{simplify by adding 5p to both sides}$$

$$25 = 15p \quad \text{simplify by dividing both sides by 15}$$

$$1.66 = p$$

The equilibrium exchange rate is £1 = \$1.66.

#### Subject vocabulary

**linear function** an equation, the graph of which is a straight line

**variable** a value that can change

**demand function** an equation that shows how quantity demanded of a good is determined by the price of the good

**quantity demanded** the amount of a good consumers are willing and able to buy at a given price over a given period of time

**supply function** equation that shows how quantity supplied of a good is determined by the price of the good

**quantity supplied** the amount of a good that firms are willing and able to produce at a given price over a given period of time

**foreign exchange market** a decentralized global market for the buying and selling of currencies

**demand** the amount of a good that consumers are willing and able to buy at each price

**supply** the amount of a good that a firm is willing and able to produce at each price

**coefficient** a number used to multiply a variable by



## Using the functions and the exchange rate, calculate the equilibrium quantity – a step-by-step guide

### Trouble shooter

The demand function is  $Q_d = 50 - 5p$ . The supply function is  $Q_s = 25 + 10p$ .  $p$  represents the exchange rate.

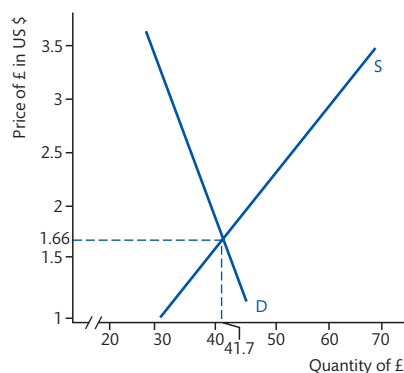
Substitute 1.66 for  $p$  in the functions.

$$Q_d = 50 - (5 \times 1.66) = 50 - 8.3 = 41.7$$

$$Q_s = 25 + (10 \times 1.66) = 25 + 16.7 = 41.7$$

The equilibrium quantity = £41.7 billion.

## Using the information from the demand and supply schedule, plot the demand and supply curves for the £ (HL)



The equilibrium exchange rate where the quantity of £s demanded is equal to the quantity of £s supplied is  $£1 = \$1.66$ . The equilibrium quantity of £s is £41.7 billion.

Figure 74.1

## Calculate the new equilibrium exchange rate and equilibrium quantity after an increase in the demand for a currency. Illustrate your answer with a diagram (HL)

A change in the value of  $a$  in the demand function represents a change in demand for a currency. For example, if demand for a country's exports increases, demand for the country's currency increases, leading to an increase in the value of  $a$  and a shift of the demand curve up and to the right.

A change in the value of  $c$  in the supply function represents a change in the supply of a currency. For example, if speculators believe a currency will fall in value they will sell the currency, leading to an increase in its supply and an increase in the value of  $c$ . The supply curve shifts down and to the right.

When income rises in the US, for example, the demand for UK exports increases. The value of  $a$  in the linear demand function  $Q_d = a - bP$  increases from 50 to 55. The new linear function is  $Q_d = 55 - 5p$ . The supply function  $Q_s = 25 + 10p$  does not change.

## Using the linear functions calculate $Q_d$ and $Q_s$ of £s when the exchange rate is $£1 = \$1$ , $£1 = \$2$ , and $£1 = \$3$ .

$$Q_d = 55 - (5 \times 1) = 55 - 5 = 50$$

$$Q_s = 25 + (10 \times 1) = 25 + 10 = 35$$

$$Q_d = 55 - (5 \times 2) = 55 - 10 = 45$$

$$Q_s = 25 + (10 \times 2) = 25 + 20 = 45$$

$$Q_d = 55 - (5 \times 3) = 55 - 15 = 40$$

$$Q_s = 25 + (10 \times 3) = 25 + 30 = 55$$

## Draw the demand and supply schedule

Exchange rate	Qd of £s (billions)	Qs of £s (billions)
£1 = \$1	50	35
£1 = \$2	45	45
£1 = \$3	40	55

### Using the functions calculate the new equilibrium exchange rate after the change in the value of $a$ in the linear demand function $Q_d = a + bP$ from 50 to 55

The demand function changes from  $Q_d = 50 - 5p$  to  $Q_d = 55 - 5p$ .

The equilibrium exchange rate is where quantity demanded = quantity supplied.

$$Q_d = Q_s \text{ when } 55 - 5p = 25 + 10p$$

$$55 - 5p = 25 + 10p \quad \text{simplify by subtracting 25 from both sides}$$

$$30 - 5p = 10p \quad \text{simplify by adding 5p to both sides}$$

$$30 = 15p \quad \text{simplify by dividing both sides by 15}$$

$$2 = p$$

The new equilibrium exchange rate is £1 = \$2.00.

### Using the functions and the exchange rate, calculate the new equilibrium quantity

The demand function is  $Q_d = 55 - 5p$ . The supply function is  $Q_s = 25 + 10p$ .  $p$  represents the exchange rate.

Substitute 2 for  $p$  in the functions.

$$Q_d = 55 - (5 \times 2) = 55 - 10 = 45$$

$$Q_s = 25 + (10 \times 2) = 25 + 20 = 45$$

The new equilibrium quantity = £45 billion.

### Using a diagram, show the changes in demand, equilibrium exchange rate, and equilibrium quantity (HL)

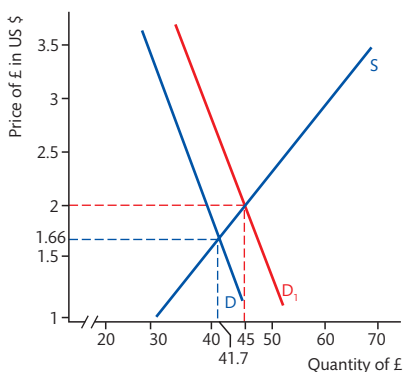


Figure 74.2

The increase in demand for UK exports from US buyers leads to an increase in demand for the £. The demand curve shifts up and to the right from  $D$  to  $D_1$  causing **excess demand** at the exchange rate £1 = \$1.66. The price of £s in terms of \$s increases to remove the excess demand. The price of the £ continues to rise until the quantity of £s demanded = the quantity of £s supplied. The new equilibrium exchange rate is £1 = \$2. The new equilibrium quantity is £45 billion.

The increase in demand for the £ causes the £ to appreciate in value against the dollar from £1 = \$1.66 to £1 = \$2.00 and equilibrium quantity increases from £41.7 billion to £45 billion.

### Subject vocabulary

**excess demand** occurs when quantity demanded is greater than quantity supplied

## Calculate the change in the exchange rate from a percentage change in price (HL)

A change in a country's exchange rate leads to a change in the price of imports and a change in the price of exports. When a country's exchange rate appreciates, the price of its imports falls and the price of its exports increases. When a country's exchange rate depreciates, the price of its imports increases and the price of its exports falls.

If the price of the £ rises by 5% then the price of the UK's exported goods increases by 5%. Therefore if the price of the UK's exports rises by 5% it can be assumed that the £ has appreciated by 5%. If the price of UK exports



falls by 5% it can be assumed that the £ has depreciated by 5%. If the price of imports falls by 5% then it can be assumed that the £ has appreciated by 5%. If the price of imported goods into the UK increases by 5% it can be assumed that the £ has depreciated by 5%.

The price of the euro in terms of Australian dollars (AUD) is 1 euro = 1.5 AUD. Italy exports olive oil to Australia. The price per unit is 10 euro. Australian buyers of imported olive oil pay 15 AUD per unit ( $1.5 \times 10 = 15$ ). The price per unit of the imported olive oil then increases by 10%.

### Calculate 10% of 15 AUD

$(15/100) \times 10 = 0.15 \times 10 = 1.5$ . The price increases by 1.5 AUD.  $1.5 \text{ AUD} + 15 \text{ AUD} = 16.5 \text{ AUD}$ . The price of olive oil per unit rises from 15 AUD to 16.5 AUD.

The price paid by domestic buyers in Italy remains at 10 euro. The price of exported olive oil from Italy into Australia has increased by 10% therefore it can be assumed that the euro has appreciated against AUD by 10%.

### Calculate the percentage change in the value of the euro – a step-by-step guide

#### Trouble shooter

Before the price increase the price per unit of olive oil in Italy was 10 euros and the price in Australia was 15 AUD.

The formula to calculate the exchange rate for euros against AUD using these prices is:

Price of the good in AUD/price of the good in euros = the price of euros in terms of AUD

$15 \text{ AUD}/10 \text{ euro} = 1.5$ . The exchange rate is 1 euro = 1.5 AUD.

After the 10% increase in price, Australian buyers of imported olive oil pay 16.5 AUD.

Price of the good in AUD/price of the good in euros = the price of euros in terms of AUD.

$16.5 \text{ AUD}/10 \text{ euro} = 1.65$ .

The exchange rate is 1 euro = 1.65 AUD.

The price of the euro in terms of the AUD has increased from 1 euro = 1.5 AUD to 1 euro = 1.65 AUD.

The formula used to calculate the percentage increase in the value of the euro is

**(The new exchange rate – the original exchange rate)  $\times$  100**

**$(1.65 \text{ AUD} - 1.5 \text{ AUD}) \times 100 = 0.15 \times 100 = 15 = 10\%$**

The value of the euro has appreciated by 10%.

It now costs 10% more to buy the same quantity of euros. The value of AUD has depreciated by 10%.

### Test your understanding of this unit by answering the following questions

- The price of Yen in terms of euros is 1 Yen = 0.0070 euro. Calculate the price of euros in terms of Yen.
- The price of a good produced in France is €80. How much is this good in Yen?
- The exchange rate changes from US\$1 = €0.70 to US\$1 = €0.80. Calculate the percentage change in the value of the US\$ against the euro. Explain the change in price in euros of a good that is exported from the US to Spain priced at \$1,500.
- Given the linear functions  $Q_d = 50 - 10p$  and  $Q_s = 25 + 15p$ , calculate the exchange rate for British pounds in terms of US dollars. The value of  $a$  in the demand function  $Q_d = a - bP$  increases by 5. Calculate the new exchange rate.

## Learning Outcomes

- Describe a fixed exchange rate system involving commitment to a single fixed rate.
- Distinguish between a devaluation of a currency and a revaluation of a currency.
- Explain, using a diagram, how a fixed exchange rate is maintained.
- Explain how a managed exchange rate operates, with reference to the fact that there is a periodic government intervention to influence the value of an exchange rate.
- Examine the possible consequences of overvalued and undervalued currencies.
- Compare and contrast a fixed exchange rate system with a floating exchange rate system, with reference to factors including the degree of certainty for stakeholders, ease of adjustment, the role of international reserves in the form of foreign currencies, and flexibility offered to policy makers.

### Describe a fixed exchange rate system

A fixed exchange rate is an exchange rate that is set by the government and maintained by the central bank so that the value of the currency in terms of another currency does not change – it is fixed.

### Explain how a fixed exchange rate is maintained

A floating exchange rate is determined by the demand and supply of a currency. A change in the demand for the currency and the supply of the currency leads to a change in the **exchange rate**.

**Model sentence:** When changes in the forces of demand and supply lead to a change in the exchange rate, the central bank must intervene in the **foreign exchange market** in order to keep the exchange rate at its fixed rate.

In this example, the Australian government wants to fix the price of the Australian dollar (AUD) against the euro at 1 AUD = 0.60 euros. When the equilibrium exchange rate determined by the demand and supply of the

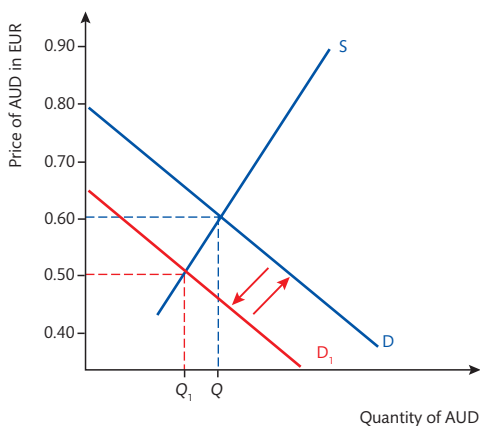


Figure 75.1

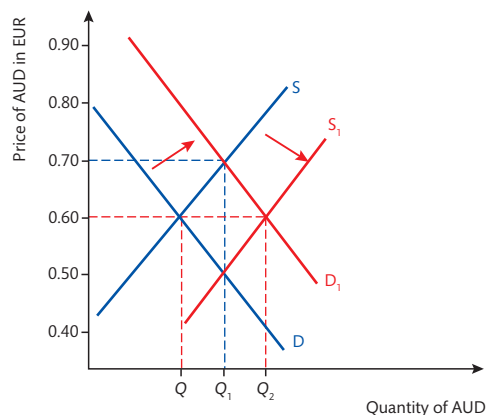


Figure 75.2

currency is 1 AUD = 0.60 euros the central bank does not have to intervene. However, if there is a fall in demand for the AUD, for example because the demand for Australian exports to Europe falls, the exchange rate will fall. In Figure 75.1 the demand curve shifts down and to the left from  $D$  to  $D_1$ . Without government intervention there would be **excess supply** of AUD at the fixed exchange rate. To remove the excess the exchange rate falls from 1 AUD = 0.60 euros to 1 AUD = 0.50 euro. In order to maintain the fixed rate of 1 AUD = 0.60 euros the Australian central bank must increase the demand for the AUD, thereby shifting the **demand curve** up and to the right from  $D_1$  back to  $D$ .

In this example, there is an increase in demand for Australian exports. The demand for its currency increases leading to a shift up and to the right of the demand curve from  $D$  to  $D_1$  as shown in Figure 75.2. There would be **excess demand** for the AUD and the exchange rate would rise to 1 AUD = 0.70 euros if the Australian central bank does not intervene. To maintain the fixed exchange rate the central bank must increase the supply of AUD thereby removing the excess demand. The **supply curve** shifts down and to the right from  $S$  to  $S_1$  and the exchange rate returns to the fixed rate 1 AUD = 0.60 euros.

### Subject vocabulary

**exchange rate** the price of a country's currency in terms of another currency

**foreign exchange market** a decentralized global market for the buying and selling of currencies

**excess supply** occurs when quantity supplied is greater than quantity demanded

**demand curve** a graph that shows the relationship between price and quantity demanded

**excess demand** occurs when quantity demanded is greater than quantity supplied

**supply curve** a graph that shows the relationship between price and quantity supplied

## Subject vocabulary

**foreign reserves** the amount of foreign currency and gold that is held by the central bank of a country

**interest rate** the percentage amount charged by a lender for money borrowed

**international trade** the cross-border exchange of goods and services

**quota** a physical limit placed on the number of goods that can be traded or produced

**tariffs** a tax placed on imported goods and services

**foreign direct investment** cross-border investment, usually by firms, that involves the acquisition of assets in a foreign country. FDI can be the purchase of a minimum of 10% of the shares of a foreign company but also includes the creation of productive capacity

**investment** the addition to capital stock

## How do governments and central banks change the demand for, and supply of, its currency?

**Foreign reserves**, usually US dollars and euros, are currencies held by central banks. When the demand for AUD falls the Australian central bank can use its reserves of euros to buy Australian dollars thereby increasing demand for the currency. The demand curve shifts back up and to the right from  $D_1$  to  $D$  returning its value to the fixed exchange rate as shown in Figure 75.1 (on page 223). When demand for AUD increases leading to excess demand at the fixed exchange rate, the Australian central bank can sell its own currency on the foreign exchange market thereby increasing its supply and removing the excess demand. The supply curve shifts down and to the right from  $S$  to  $S_1$  as shown in Figure 75.2 (on page 223) and the exchange rate returns to its fixed rate.

If there is excess supply of AUD at the fixed exchange, the central bank can increase **interest rates** thereby increasing the returns on money saved in Australian banks. In order to deposit money in Australian banks foreign savers exchange their currencies for AUD, thereby increasing demand for the AUD and removing the excess supply. The demand curve shifts up and to the right from  $D$  to  $D_1$  and the exchange rate returns to the fixed rate 1 AUD = 0.60 euros.

When demand increases for the AUD the central bank can lower interest rates to push the value of the currency back down. Some savers will remove their deposits of AUD from Australian banks in order to earn higher returns in another country's bank. The depositors sell AUD and buy another currency thereby increasing the supply of AUD. The supply curve shifts down and to the right from  $S$  to  $S_1$ , as shown in Figure 75.2 (on page 223), thereby maintaining the exchange rate at 1 AUD = 0.60 euros.

If through **international trade** there is pressure pushing the value of the currency down from its fixed rate the government can reduce the number of imports to reduce the supply of its currency. Limiting imports leads to a fall in the supply of its currency used to buy the imported goods thereby putting upward pressure on the value of the currency. To achieve this objective the government raises barriers to trade by the use of **quotas** and **tariffs**. If there is downward pressure on a currency the government can encourage **foreign direct investment**, for example by reducing the amount of tax on company profits. This increases demand for its currency thereby pushing its value up.

## Distinguish between appreciation and revaluation, and between depreciation and devaluation

The appreciation of a currency occurs when the value of the currency increases due to changes in the demand for, and supply of, a currency under a floating exchange rate system. Revaluation is when the rate at which a currency is fixed is raised.

The depreciation of a currency occurs when the value of the currency falls due to changes in the demand for, and supply of, a currency under a floating exchange rate system. Devaluation is when the rate at which a currency is fixed is reduced.

## Subject vocabulary

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**trade barriers** restrictions put in place by government on international trade in order to protect domestic jobs and industries. Examples include subsidies and tariffs.

**contractionary fiscal policy** policy involving the reduction of government spending and/or the increase of taxation

**current account** a record of the amount of money flowing out of a country and into the country from the rest of the world from the trade in goods and services, investment income, and transfers in a given period of time

## Explain how a managed exchange rate operates

Most countries intervene at some point in response to extreme pressure on their exchange rates even if they use the floating exchange rate system. Most countries do not have a fixed exchange rate but manage their currencies so that the value does not rise above or fall below acceptable levels. If the central bank believes that the value of its currency might be moving beyond the upper or lower values, the government intervenes by selling or buying reserve currencies and/or by changing interest rates. This affects the value of its currency as previously explained. A government does not want the value of its currency to rise or fall too much because it affects the price of imports and exports leading to business uncertainty. For example, if export prices go up and down it is difficult for exporting firms to estimate demand for their goods. This can lead to a fall in **investment**.

## Compare and contrast a fixed exchange rate system with a floating exchange rate system

To answer this it is necessary to examine the advantages and disadvantages of both systems.

### Discuss the advantages of a fixed exchange rate system

A fixed exchange rate system leads to greater business certainty than under a floating exchange rate. Importers and exporters are more certain of the prices of imports and exports. For example, wholesalers buying consumer goods from foreign producers know that the price they pay is not going to be affected by changes in the exchange rate and importers of **raw materials** can be more certain of their future costs of production. Business investment is less risky because the quantity of their goods demanded will not change when the exchange rate changes.

**Model sentence:** A fixed exchange rate does not vary. The price of exports is not affected by exchange rate changes, therefore demand for them is more stable making investment less risky.

If speculators (traders in currencies) believe that the fixed rate is appropriate a fixed rate should reduce speculation in the foreign exchange market. Stability of an exchange rate is hard to achieve under a floating system due to speculation. If speculators believe the central bank is determined to maintain a fixed rate, it reduces the opportunities to gain from the buying and selling of currencies.

**Inflation** increases the price of exports leading to a fall in international price competitiveness. Under a fixed exchange rate system, the exchange rate cannot depreciate to reduce the price of exports, therefore the government and the central bank must follow **fiscal policies** and **monetary policies** that keep inflation under control in order to maintain the competitiveness of the country's exports. If the government is successful in controlling inflation the central bank will be able to set lower interest rates, which will help to increase investment and thereby increase **productivity**.

### Discuss the disadvantages of a fixed exchange rate system and the consequences of overvalued and undervalued currencies

In order to ensure that all **stakeholders** in the economy are confident that the fixed rate will be maintained the central bank must be prepared to act when market forces push the value of the currency up or down. The main way in which a central bank affects the value of its currency is by changing interest rates. For example, if the demand for the currency falls the exchange rate will fall unless the government increases demand for the currency by increasing interest rates.

**Model sentence:** If interest rates are set to affect the exchange rate they cannot at the same time be used to achieve other macroeconomic objectives such as **economic growth** and **low unemployment**.

A high interest rate set to attract foreign deposits at a time of recession will lead to a deeper and longer **recession** and higher levels of unemployment.

If the exchange rate is set at the wrong level, too high for example, exporters may not be able to compete on price leading to a fall in **aggregate demand**. And the demand for imports would be high leading to a growing **current account deficit**. If the exchange rate is set too low it could lead to **imported inflation**. If a country finds itself having to defend the exchange rate continuously by selling its **foreign reserves** and buying its own currency, eventually the reserves will begin to run out. If speculators believe that the central bank will not be able to continue defending the currency and that the government will eventually devalue its currency they will sell the currency increasing its supply and putting further downward pressure on its value.

Some countries use a low exchange rate as a form of **protectionism**. A low exchange rate lowers the price of exports increasing their consumption. This can lead to international arguments over trade and other countries can respond to a country that is deliberately keeping its exchange rate low by raising **trade barriers**.

### Discuss the advantages of a floating exchange rate system

Interest rates do not have to be used to affect the exchange rate, therefore they can be used to achieve domestic macroeconomic objectives. A government does not have to depend on fiscal policy to achieve macroeconomic objectives. Controlling inflation, for example, is likely to be more successful when the government can increase interest rates along with **contractionary fiscal policies**. Governments do not need to hold large quantities of foreign reserves to defend the currency so, for example, the money can be used by the government for investment purposes.

A floating exchange rate in theory should self-adjust so as to keep the **current account** in balance. If the income spent on imports is greater than the income spent on exports the country has a current account deficit. With fewer exports being bought the demand for the currency is low and with more imports being bought the

### Subject vocabulary

**raw material** the basic material from which a good is made

**inflation** an increase in the general level of prices of goods/services in an economy over a given time period, usually a year

**fiscal policy** government policy designed to achieve macroeconomic objectives through government expenditure and taxation

**monetary policy** the control of the supply of money by the central bank to affect the economy (e.g. changing interest rates)

**productivity** the quantity of output per unit of input

**stakeholders** people or groups who have an interest in, or are affected by, the activities of organisations, particularly businesses

**economic growth** an increase in real GDP

**unemployment** occurs when there are people actively looking for work at the equilibrium wage rate but are not able to find work

**recession** two consecutive quarters of negative economic growth

**aggregate demand** the total demand for goods and services in the economy at a given price level in a given period of time

**current account deficit** occurs when the amount of money flowing out of a country from the trade in goods and services, investment income, and transfers is greater than the amount flowing in

**imported inflation** inflation caused by an increase in the price of imported goods. For example as the price of imported raw materials increase it leads to an increase in the price of domestically produced goods.

**foreign reserves** the amount of foreign currency and gold that is held by the central bank of a country

**protectionism** government policies, including tariffs, quotas, and subsidies, that restrict the extent of international trade and which are implemented in order to protect domestic industries from cheaper imports

continued on page 224

## Subject vocabulary

**forces of demand and supply** changes in the determinants of demand and supply in a market that affect the market price and the allocation of resources

**investment** the addition to capital stock

**resources** the inputs into the production process, the factors of production

**substitute** a good that can be used in place of another good

**price inelastic** the percentage change in quantity demanded/supplied < the percentage change in price

**cost-push inflation** inflation caused by an increase in the costs of production, resulting in a decrease in aggregate supply

## Glossary

**speculation** investing hoping to gain, but with the risk of loss

supply of the currency is high. The **forces of demand and supply** push down the value of the currency. As the currency depreciates exports become relatively cheaper and imports become relatively more expensive. Income spent on exports rises and income spent on imports falls leading to a reduction in the current account deficit.

A current account surplus is when income spent on exports is greater than income spent on imports. The demand for the currency is greater than the supply. The excess demand pushes up the exchange rate causing the price of exports to rise and the price of imports to fall. Income spent on export falls and income spent on imports increases leading to a fall in the current account surplus.

**Model sentence:** As the exchange rate rises the price of exports increases and the price of imports falls, leading to a fall in the quantity of exports demanded and an increase in the quantity of imports demanded.

**Model sentence:** As the exchange rate falls the price of exports falls and the price of imports rises, leading to an increase in the quantity of exports demanded and a fall in the quantity of imports demanded.

## Discuss the disadvantages of a floating exchange rate system

Floating exchange rates can lead to business uncertainty. When the exchange rate changes the price of imports and exports changes. Businesses importing raw materials are unsure what their costs will be in the future. Demand for exports is in part determined by the exchange rate because changes in the exchange rate affect price. Uncertainty over future levels of demand and uncertainty over costs lead to an increase in the risk of **investment** and therefore a fall in investment. When prices are changing continuously it is difficult to work out potential returns on investment.

**Model sentence:** As the floating exchange rate goes up and down it leads to variable export prices and therefore variable demand for exports. This makes it difficult for exporters to plan future levels of production and makes investment more risky.

A country that has few or no **resources** must import them leading to a very high supply of its currency. The price of imported resources is high but firms have little choice but to carry on importing them as there are no domestic **substitutes** making demand for imports **price inelastic**. The exchange rate does not self-adjust because demand for imports and therefore supply of the currency remains high. The exchange rate remains low leading to higher business costs that can cause **cost-push inflation** making the goods less price competitive.

High inflation reduces a country's international price competitiveness leading to a fall in demand for its exports. The relative price of imports is lower thereby increasing demand for imports. Low demand for the currency due to low demand for exports and high supply of the currency due to high demand for imports lead to a low exchange rate. High demand for imports and low demand for exports will worsen the country's current account deficit. The exchange rate may self-adjust but this can take time.

A floating exchange rate encourages **speculation**. Speculation is arguably a waste of resources and can weaken an economy by reducing confidence in a currency even when the economy is doing well. Speculation can cause a sudden selling of a currency, increasing the supply of the currency and pushing the exchange rate down.

## Test your understanding of this unit by answering the following questions

- Distinguish between a fixed exchange rate system and a floating exchange rate system.
- Explain how a fixed exchange rate is maintained.
- Discuss the advantages and disadvantages of a fixed exchange rate system and a floating exchange rate system.